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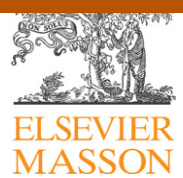

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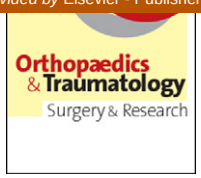

CLINICAL REPORT

Percutaneous internal fixation in the management of lumbar spondylitis: Report of two cases

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KEYWORDS
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Summary Surgically managed bacterial spondylitis is rare, and a variety of operative techniques are currently available, without any real consensus. The present study reports an original, less invasive surgical treatment for spondylitis, in two patients. An initial percutaneous posterior instrumentation fixation was followed by an anterior interbody graft performed through a retroperitoneal route. Postoperative bacterial typing was done; pain resolution was obtained in both patients. Control CT scan showed good restitution of the disk space height and a satisfactory reduction of the local kyphosis. Fusion was achieved at 6 months in both cases, with stable results at long-term follow-up. In patients presenting comorbid conditions, this technique gave interesting preliminary results, was less traumatic and shorter to perform, and finally entailed a limited operative risk.

Introduction

Bacterial spondylitis is a rare spinal infection, with an annual incidence of around 1400 cases in France [1]. Management classically comprises brace immobilization of the spine and antibiotherapy according to bacterial typing. In certain clinical situations (intense analgesic-resistant pain, involvement of endplates and of vertebral bodies above and below the discitis, or failure of bacterial typing by hemoculture and/or discal puncture), however, require surgical debridement and excision of infected tissue. Disk exeresis and endplate stripping leaves a residual interbody defect that may require stabilization of the spine. Various techniques involving anterior route interbody grafting have been described, with results showing good fusion without recurrence of infection [2,3]. Isolated anterior grafting, however, necessitates postoperative immobilization to ensure against bone-graft mobilization and collapse. Certain authors have therefore argued for associating posterior stabilization to the anterior surgery, despite a possible risk of infection by contact with the equipment [4].

The present study reports results in two cases managed by percutaneous posterior osteosynthesis followed by anterior interbody graft, with a mean of 11-month follow-up.

Technique and observations

Our experience comprises two patients managed with this technique. Spondylitis was diagnosed by the association

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of clinical (inflammatory spinal pain), biological (moderate hyperleukocytosis, elevated CRP and sedimentation rate [SR]) and radiological signs (disk/body damage on CT, abscess on MRI). Diagnosis was in both cases confirmed from peroperative bacteriological sampling, after failure of initial typing by discal puncture and hemoculture.

Surgery was indicated by severe analgesic-resistant pain, damage to endplates and vertebral bodies above and below the discitis, and failure of bacterial typing by hemoculture and/or disk puncture.

Surgery was divided into two steps. The first comprised percutaneous posterior osteosynthesis using Sextant™ equipment (Medtronic Sofamor Danek, Memphis, TN, USA). Pedicle screwing was performed under frontal and lateral brilliance amplification one level proximally and distally to the affected disk. The second step comprised tricortical iliac grafting impacted into the interbody space, with an anterior left peritoneal approach to the spine. All infected tissue was debrided and removed, with drainage of any abscess, and sent for bacteriological typology culture and antibiogram calculation. These two steps were performed separately at a 1-week interval. No postoperative restraint was prescribed, and the patients were put on their feet after removal of the drain at 2 days.

Results were analyzed clinically, in terms of pain as assessed on a visual analog scale (VAS) and of the evolution of the infectious syndrome. Biological analysis confirmed the clinical normalization of the inflammation. Both patients underwent CT control to check implant positioning and analyze sagittal balance. As described by Ha et al. [5], disk space height restoration was measured between the middle of the under- and over-lying endplates (using the superior sacral endplate in case of sacrolumbar involvement); restoration of the sagittal local kyphosis angle was analyzed by measuring the angle subtended by the perpendiculars to the under- and over-lying endplates.

Double antibiotherapy was prescribed according to the antibiogram drawn up from the peroperative samples, as recommended by Grados et al. [6]. Intravenous administration, pursued until the patient had been free of fever for two consecutive weeks, was followed by a total 3-month per os antibiotherapy with regular biological check-up. Both patients were then followed up in the department.

Case no. 1

The first patient was a male 40-year-old ex-addict under opiate substitution therapy who consulted for lower lumbar pain of recent onset, predominating on the right, inflammatory in nature but exacerbated by standing. There was no neurologic impairment, but the VAS pain score was 7/10, with difficulty in walking and requiring category-III analgesics.

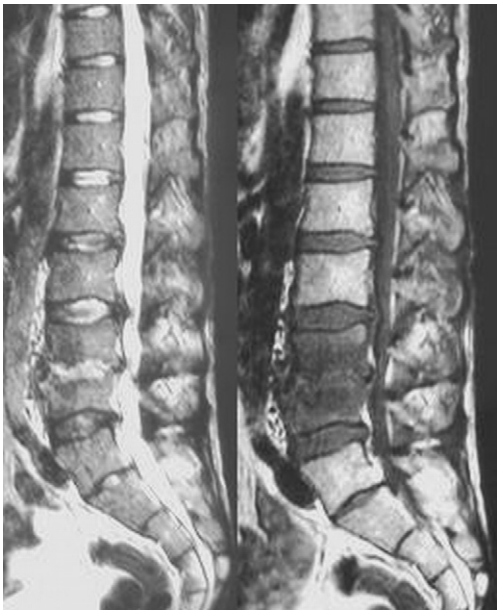

Figure 1 Magnetic resonance imagery, T1 and T2 weighted, showing the infectious process (patient 1).

Inflammation assessment found an inflammatory syndrome with 18.6 Giga/L hyperleukocytosis, 73 mm 1st-hour SR and 26 mg/L CRP. CT and MRI scans showed signs of L4-L5 spondylitis (Fig. 1) with right iliopsoas abscess (Fig. 2). Bacterial typing on peroperative samples found oxacillin-sensitive *Staphylococcus aureus*, probably contracted cutaneously, treated by double antibiotherapy.

X-ray assessment confirmed good implant positioning and graft non-mobility. Pre- and postoperative local kyphosis was 16° and 24° respectively, and 22° at long-term follow-up after fusion. Disk space height also improved, from 3.5 cm preoperatively to 4.2 cm postoperatively and 4.1 cm at long-term follow-up after fusion.

Case no. 2

The second patient was a 77-year-old man admitted for acute exacerbation of lumbar pain with associated

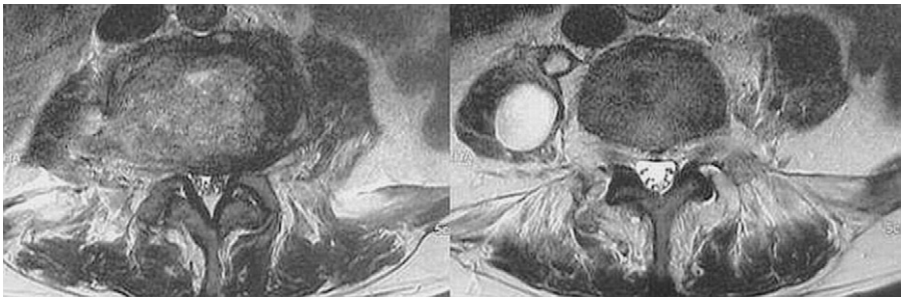

Figure 2 Magnetic resonance imagery, axial views showing discitis (left view) and abscess in the muscle (right view) (patient 1).

Figure 3 Lumbar CT scan showing endplate destruction at the lumbosacral junction (patient 2).

Figure 4 Three-month postoperative CT scan, implant positioning check and measurement of local kyphosis.

inflammation. Neurologic assessment was normal, but the pain score was 8/10, walking was impossible and category-III analgesics were required. Initial biological assessment found 13.7 Giga/L hyperleukocytosis, 108 mm 1st-hour SR and 209 mg/L CRP. CT (Fig. 3) and MRI scans showed signs of L5-S1 spondylitis with prediscal abscess. Bacterial typing on peroperative samples found amoxicillin-sensitive *Streptococcus constellus*, of unknown entry, treated by double antibiotherapy.

X-ray assessment confirmed good implant positioning and graft non-mobility. Pre- and postoperative local kyphosis was 10° and 18° respectively, and 18° at long-term follow-up after fusion. Disk space height also improved, from 4.3 cm preoperatively to 5 cm postoperatively and 4.8 cm at long-term follow-up after fusion.

Pooling the two patients' data, step 1 (posterior percutaneous osteosynthesis) lasted a mean 45 minutes with negligible blood-loss. Anterior grafting (step 2) lasted a mean 80 minutes, with slight blood-loss not requiring transfusion.

Neither case showed postoperative complications, and both men were on their feet once the Redon drain was removed on day 2. The mean postoperative pain score was significantly improved at 2/10, and simple analgesics could be prescribed.

Postoperative X-ray and CT scan confirmed good implant positioning (Fig. 4) and graft non-mobility.

Successive clinical and X-ray check-ups found no complications, with fusion in both cases (Fig. 5). Microbiological evolution was favorable, with regression of the infectious syndrome enabling cessation of antibiotherapy after a total 3-month treatment.

Both patients were followed up regularly in the department, up to 15 months for the first and 8 months for the second.

Discussion

Spondylitis management has multiple objectives:

- to treat the infection;
- to restore good spinal stability;
- to treat the pain and any associated neurologic disorder.

Several techniques have been described, whether isolated anterior treatment or with associated posterior fixation. A posterior percutaneous approach via external fixator was also developed by Jeanneret and Magerl [7]

Figure 5 Six-month postoperative CT scan, showing solid bony fusion (patient 1).

before the advent of percutaneous osteosynthesis techniques. According to some, anterior cancellous autograft after surgical debridement is enough [8]. Isolated procedures, however, run the risk of secondary graft mobilization with gradual loss of the peroperative correction. Dennis et al. [9] reported loss of disk space height in 10% of levels treated, with postoperative height lower than preoperative values in 46% of cases. Oxland et al. [10] argue that this is biomechanically related to endplate abrasion, significantly reducing vertebral body rigidity and resistance. Tricortical grafts are more resistant than cancellous ones, which, associated with osseous graft resorption, leads to impaction. The infectious lesions, however, often require debridement sacrificing the vertebral endplates.

To limit graft impaction and kyphosis correction, it has been suggested that the anterior graft should be associated to preliminary or subsequent posterior stabilization osteosynthesis [11,12]. In the present study, posterior osteosynthesis was performed as step 1, so as to open the disk space and facilitate anterior grafting, impacted into the intervertebral space to limit secondary mobilization when the posterior lordosis instrumentation was set up. Our experience is of setting up the instrumentation one level more proximally and distally to the affected disk, to limit equipment-contact infection risk. The 1-week interval between steps enhanced patient tolerance for surgery, avoiding the need for general anesthesia which, while it would have been required once only, would have been prolonged by changing installations.

A double approach gives good results and enables graft stabilization, but is also associated with longer surgery and more blood-loss and postoperative complications [13] in patients often presenting with comorbidity. Percutaneous osteosynthesis thus seemed particularly interesting, as a minimally invasive approach ensuring assembly stability without loss of correction. The absence of postoperative constraint and early standing reduce immobilization and admission time in fragile patients. A percutaneous technique was made possible by the absence of any neurologic disorder.

Surgical management of bacterial spondylitis remains a subject of discussion, and many surgical techniques give good results. The present minimally invasive approach gave good short-term results and is an interesting indication for this rare pathology.

Conflict of interest

None.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.otsr.2009.03.002.

References

[1] Grammatico-Guillon L, Barron S, Ingrand P, Surer N, Rusch E, Desenclos J-C, et al. Épidémiologie de la spondylodiscite infectieuse en France : l'apport du programme médical des systèmes d'information (PMSI), 2002—2003. Bull Epidemiol Hebd 2007;43:367—70.
[2] Emery SE, Chan DP, Woodward HR. Treatment of hematogenous pyogenic vertebral osteomyelitis with anterior debridement and primary bone grafting. Spine 1989;14:284—91.
[3] Fang D, Cheung KM, Dos Remedios ID, Lee YK, Leong JC. Pyogenic vertebral osteomyelitis: treatment by anterior spinal debridement and fusion. J Spinal Disord 1994;7:173—80.
[4] Ha KY, Chung YG, Ryoo SJ. Adherence and biofilm formation of *Staphylococcus epidermidis* and *Mycobacterium tuberculosis* on various spinal implants. Spine 2005;30:38—43.
[5] Ha KY, Shin JH, Kim KW, Na KH. The fate of anterior autogenous bone graft after anterior radical surgery with or without posterior instrumentation in the treatment of pyogenic lumbar spondylodiscitis. Spine 2007;32:1856—64.
[6] Jeanneret B, Magerl F. Treatment of osteomyelitis of the spine using percutaneous suction/irrigation and percutaneous external spinal fixation. J Spinal Disord 1994;7:185—205.
[7] Grados F, Lescure FX, Senneville E, Flipo RM, Schmit JL, Fardellone P. Suggestions for managing pyogenic (non-tuberculous) discitis in adults. Joint Bone Spine 2007;74:133—9.
[8] Klöckner C, Valencia R. Sagittal alignment after anterior debridement and fusion with or without additional posterior instrumentation in the treatment of pyogenic and tuberculous spondylodiscitis. Spine 2003;28:1036—42.
[9] Dennis S, Watkins R, Landaker S, Dillin W, Springer D. Comparison of disc space heights after anterior lumbar interbody fusion. Spine 1989;14:876—8.
[10] Oxland TR, Grant JP, Dvorak MF, Fisher CG. Effects of endplate removal on the structural properties of the lower lumbar vertebral bodies. Spine 2003;28:771—7.
[11] Fukuta S, Miyamoto K, Masuda T, Hosoe H, Kodama H, Nishimoto H, et al. Two-stage (posterior and anterior) surgical treatment using posterior spinal instrumentation for pyogenic and tuberculotic spondylitis. Spine 2003;28:E302—308.
[12] Dimar JR, Carreon LY, Glassman SD, Campbell MJ, Hartman MJ, Johnson JR. Treatment of pyogenic vertebral osteomyelitis with anterior debridement and fusion followed by delayed posterior spinal fusion. Spine 2004;29:326—32.
[13] Krödel A, Krüger A, Lohscheidt K, Pfahler M, Refior HJ. Anterior debridement, fusion, and extrafocal stabilization in the treatment of osteomyelitis of the spine. J Spinal Disord 1999;12:17—26.